EXPERIMENT NO. 8: DESIGN OF POWER SUPPLY

OBJECTIVES:

Design of power supply using suitable software and measure the input and output voltage. Also display the waveform on the display device.

APPARATUS:

Sr. No.	Equipment / Software	Specification / Description
1	Simulation software	Multisim / Proteus / LTspice
2	Transformer	230 V / 12 V, 1 A
3	Diodes	1N4007 (for rectifier)
4	Capacitors	470 µF, 100 µF,
5	Zener Diode	12V
6	Transistor	2SC1061
7	Resistors	100Ω,1KΩ, 560Ω
8	Virtual Instruments	Voltmeter, Oscilloscope

THEORY:

A DC power supply converts AC mains voltage into a steady DC voltage suitable for powering electronic circuits.

The process consists of several stages:

1. Step-Down Transformer:

   Reduces the high AC mains voltage (230 V) to a lower AC voltage (e.g., 12 V AC).
2. Rectifier:

   Converts the AC voltage into pulsating DC.
   - Half-wave rectifier: Uses one diode.
   - Full-wave rectifier: Uses a center-tapped transformer and two diodes.
   - Bridge rectifier: Uses four diodes (most common).

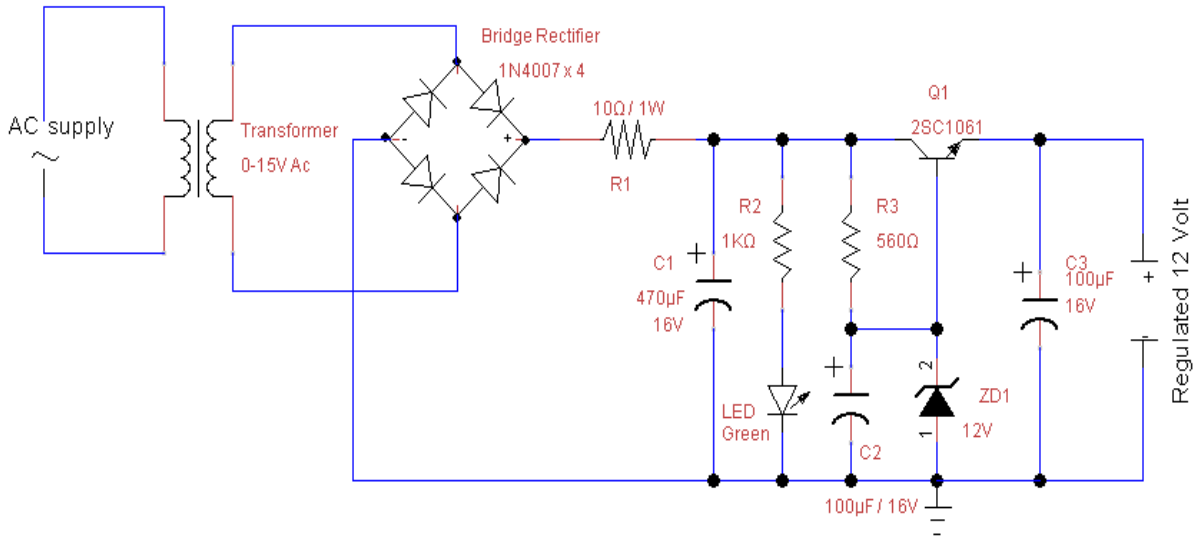
3. Filter:

   A capacitor smooths the pulsating DC by reducing ripples.

4. Voltage Regulator:

   Zener diode acting as voltage regulator and gives constant DC voltage.

Circuit Diagram



Here this circuit constructed with bridge rectifier and zener regulator. This circuit as 12 volt power supply source for stepper motor, servo motor and peripherals need 12V.

The step down transformer reduce AC supply to 15v AC and four 1N4007 diodes connected as bridge rectifier this will give regulated DC supply. This DC filtered by using C1 (470uF/16v) capacitor and then filtered DC supply fed into 12v zener diode by the way of zener break down the DC supply regulated in 12v. The transistor 2sc1061 drives the output supply to the load.

Procedure:

1. Open the simulation software (Multisim / Proteus / LTspice).
2. Select components: transformer, diodes, capacitor, regulator IC, resistors, transistor, zener diode, voltmeter, and oscilloscope.
3. Construct the circuit as per the block diagram of the power supply.
4. Simulate the circuit.
5. Measure the voltages:

- Input (AC) voltage at transformer secondary.
- Output (DC) voltage across the load resistor.

6. Display the waveforms:
    - Use the oscilloscope to view:
        - Input waveform (sine wave)
        - Rectified waveform (pulsating DC)
        - Filtered waveform (smooth DC)
7. Record the readings and compare with expected values.

Result :

DC Regulated Output Voltage: _____

CONCLUSION:

A 12V regulated DC power supply was designed using a bridge rectifier, filter capacitor, and zener voltage regulator.
The simulation verified correct conversion from AC to DC with proper voltage regulation and minimal ripple.

Post-Lab Questions

1. What is the purpose of a regulated power supply?
2. Why is a Zener diode used in the regulator circuit?
3. What is the role of the emitter follower (transistor) in this circuit?
4. Why is a filter capacitor used after the rectifier?
5. What type of waveform do you observe at each stage of the power supply?